

ORIGINAL  
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R-585-3-9-46

SITE INSPECTION OF  
ITT GRINNELL CORPORATION  
PREPARED UNDER

TDD NO. F3-8806-06  
EPA NO. PA-335  
CONTRACT NO. 68-01-7346

FOR THE  
HAZARDOUS SITE CONTROL DIVISION  
U.S. ENVIRONMENTAL PROTECTION AGENCY

JUNE 9, 1989

NUS CORPORATION  
SUPERFUND DIVISION

SUBMITTED BY

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REGIONAL OPERATIONS  
MANAGER, FIT 3

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## SECTION 1

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## **1.0 INTRODUCTION**

### **1.1 Authorization**

NUS Corporation performed this work under Environmental Protection Agency Contract No. 60-01-7346. This specific report was prepared in accordance with Technical Directive Document No. F3-8806-06 for the ITT Grinnell site, located in Columbia, Lancaster County, Pennsylvania.

### **1.2 Scope of Work**

NUS FIT 3 was tasked to conduct a site inspection of the subject site.

### **1.3 Summary**

The ITT Grinnell Corporation site is an approximately 62-acre wastewater treatment facility, foundry, and galvanizing plant that is currently owned and operated by the Grinnell Corporation, a subsidiary of Tyco Labs. The corporation, an active manufacturer of malleable and ductile iron fittings and jobwork, is located northeast of Columbia in Lancaster County, Pennsylvania. The site is bordered by Lincoln Highway to the south, 15th Street to the east, Glatfelter Memorial Field to the west, and an unnamed tributary of Shawnee Run Creek to the north. A fence surrounds the property boundaries. The property was originally owned and operated by a foundry, the Columbia Malleable Casting Company, from 1925 until 1929. The company was sold to the Grinnell Corporation in 1930. Grinnell and Malleable Casting Company operated as a foundry, generating typical foundry wastes: foundry sand, furnace slag, and unusable sand cores. The past waste quantities and waste-handling procedures are unknown.

ITT Grinnell Corporation purchased Grinnell Corporation in 1968 and operated a foundry and a galvanizing operation on site from 1968 until 1986. In February 1986, the company was purchased by another company that had no relationship to the original Grinnell Corporation but was also called the Grinnell Corporation.

Between 1968 and 1986, a manufacturing plant and wastewater treatment plant were located on the site. Two unlined parallel lagoons, approximately 320 feet long and 50 feet wide by 5 feet deep, were located west of the former wastewater treatment plant and west of two separation pools. The two separation pools, located north of the main plant, were used for skimming oil off noncontact cooling water. The southernmost lagoon is currently inactive; it has been backfilled, covered, and well vegetated. The northernmost lagoon is currently active and receives wastewaters from the new wastewater treatment plant.

According to Arthur Dalla Piazza, of the Pennsylvania Department of Environmental Resources (PA DER) Bureau of Solid Waste Management, the southern lagoon underwent closure in 1981. The exact uses of this lagoon are unknown. Records indicate that the lagoon received polishing and nonpoint-source discharge, cooling water for temperature conditioning from the prior treatment plant, and surface runoff. The lagoon may have also been used for the disposal of metal hydroxide sludge cake, a product of the lime treatment of rinse waters (pickle liquors and acidic rinse water) from the galvanizing department. The current Grinnell representatives indicated that the lagoon was put into operation in 1950, and its exact uses were unknown. The discharges from the lagoons operated under permit no. 3677204.

The inactive wastewater treatment plant, located east of the southern lagoon, lime treated and gravity filtered acidic rinse waters and spent pickle liquors until its closure in 1982. The wastewater treatment plant currently houses the pumps for the new wastewater treatment plant. Records indicate that the treated wastewaters were discharged to the northern and southern lagoons and then to the unnamed tributary to Shawnee Run. At some time during its ownership, ITT Grinnell Corporation allegedly discharged acidic rinse waters and spent pickle liquors directly into the southern lagoon without a permitted treatment.

A wastewater treatment plant was built in 1982 in order to meet the effluent criteria, as outlined in the company's NPDES permit. The corporation repeatedly exceeded the interim effluent limitations for zinc and iron. The wastewater treatment plant is located northwest of the main manufacturing plant and treats all wastewater generated from the galvanizing department, including emergency and acidic rinse waters. The old wastewater treatment plant houses the pumps for the new plant. Within the new wastewater treatment plant are batch treatment tanks, a 6,000-gallon tank containing a 50-percent solution of sodium hydroxide, and a 1,000-gallon tank containing a 20-percent solution of sodium hydroxide for storage and neutralization of wastes.

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A third lagoon, located on the western side of the southern lagoon, was supposedly on site until 1983, at which time it was backfilled. The current Grinnell representatives noted that liquids were contained in this lagoon, but it is not known if the liquid was wastewater or rainwater. A wastewater inspection report from July 7, 1984, prepared by Randy King, water quality specialist for the PA DER Bureau of Water Quality Management, indicated that sludges from the northern lagoon were to be put in the western lagoon.

The ITT Grinnell Corporation obtained NDPES permits and several water quality management permits that date back to 1956. The corporation was found in violation of the Pennsylvania Clean Streams Laws on February 18, 1977 and December 19, 1980. Air quality permits are also held by the corporation for the galvanizing department and foundry operations. In addition, the corporation was permitted for the disposal of foundry wastes, including slag, sand, and baghouse dusts.

ITT Grinnell Corporation produced the same types of wastes as the current owners, Grinnell Corporation; however, the exact quantities are unknown. During the later years of operation, ITT Grinnell Corporation disposed its wastes in the same manner as Grinnell Corporation. However, earlier waste-handling practices are not known.

The current operations at the site include a foundry and a galvanizing department for the manufacturing of malleable and ductile iron fittings and jobwork. Scrap steel is purchased by the company, and the iron is liquidized by an electric induction melting technique. The liquid metal is then poured into "greensand" molds. After the molds cool, the sand is separated and recycled. The final castings are then shot cleaned to remove any sand and polished. Most products are annealed before they are sent to either a galvanizing department and/or a machine shop to be treated and assembled.

The galvanizing department, located at the southwestern corner of the main plant, houses two 2,000-gallon storage tanks for pickle liquors. In addition, there are four acid baths and three quench tanks within the galvanizing department.

PA DER conducted a preliminary assessment of the site on August 21, 1981. On March 14, 1988, NUS FIT 3 performed a site reconnaissance to locate potential sample locations. The FIT conducted a site inspection of the property on July 13, 1988 and collected soil and home well samples.

Analysis of on-site soil samples revealed elevated levels of zinc (up to 12,300 mg/kg), cadmium (up to 7.9 mg/kg), lead (up to 648 mg/kg), antimony (up to 62.7 mg/kg), and manganese (up to 7,600 mg/kg). Phenol (up to 4,400 ug/kg), 4-methylphenol (up to 440 ug/kg), and 2,4-dimethylphenol (up to 930 ug/kg) were detected in the southern inactive lagoon soil samples. Although these levels are not expected to pose a threat to human health, the possibility of further infiltration to groundwater or runoff to the surface waters in the area may exist.

No significant contaminants were measured in any of the home wells sampled.

A Quality Assurance Review of laboratory data and results is presented in section 7.0, and a Toxicological Evaluation of these results is presented in section 8.0.

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SECTION 2

## **2.0 THE SITE**

### **2.1 Location**

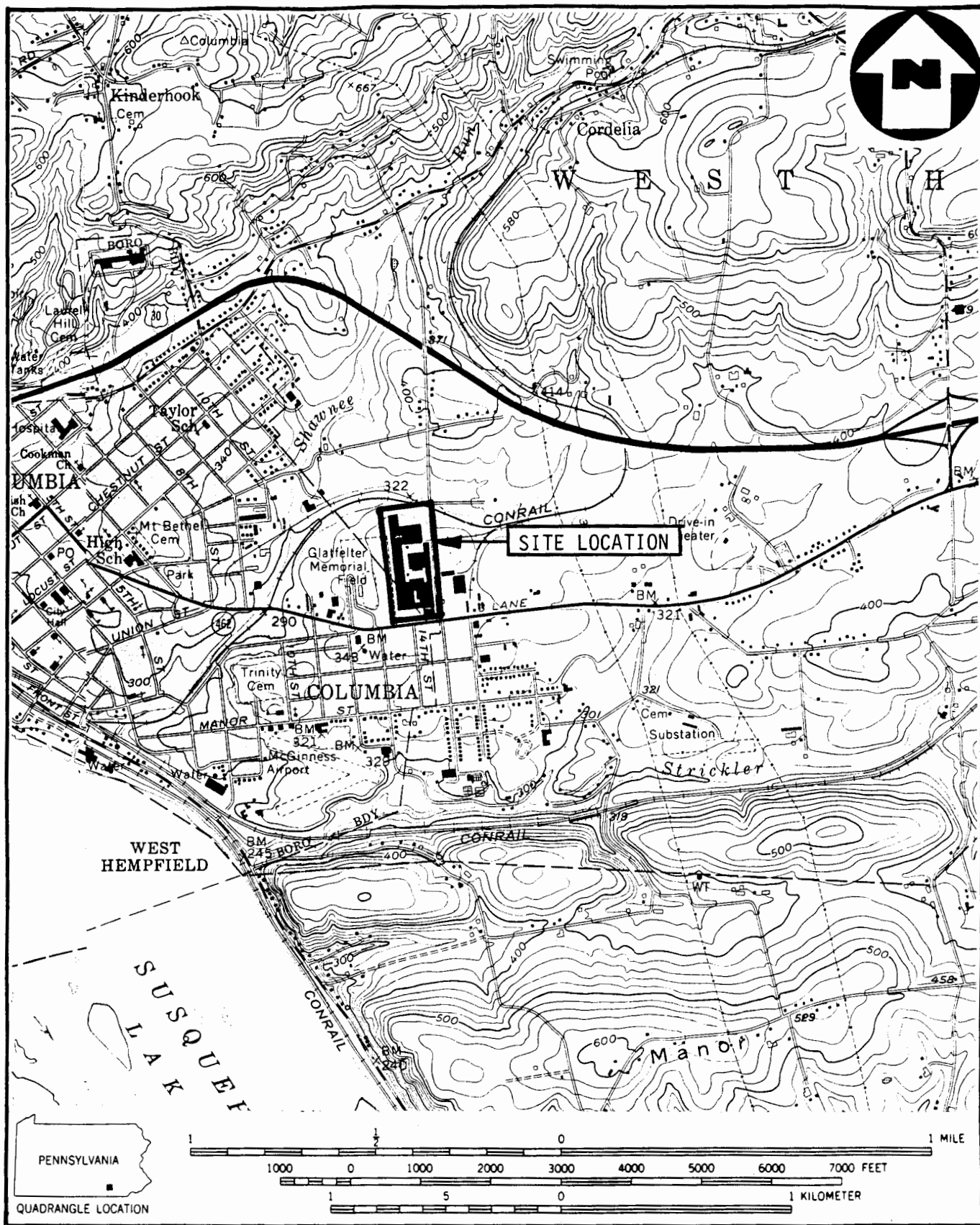
The ITT Grinnell site is located on the corner of 15th Street and Lincoln Highway (Route 462), outside the Columbia City limits in West Hempfield, Lancaster County, Pennsylvania (see figure 2.1, page 2-2). The site and the surrounding vicinity within the study area can be located on the United States Geological Survey (U.S.G.S.) Columbia East, Pennsylvania 7.5 minute series topographic map. The center of the property lies at north 40° 02' 08" latitude and west 76° 29' 06" longitude or 5.75 inches north of the southern border and 2.25 inches east of the western border of the U.S.G.S. Columbia East, Pennsylvania topographic map.<sup>1</sup>

### **2.2 Site Layout**

The approximately 62-acre site is an active foundry and galvanizing department. The property boundary is surrounded by a chain-link fence with a guard house at the entrance (see figure 2.2, page 2-3). The facility is bordered to the south by Lincoln Highway, to the east by 15th Street, to the north by an unnamed tributary of Shawnee Run and Reading Railroad, and to the west by Glatfelter Memorial Field. The site is located just northeast of the town limits of Columbia.<sup>2,3</sup>

The manufacturing plant is located on the southern portion of the site. A drum storage area for empty hydraulic oil containers is located a few yards north of the manufacturing plant. The new wastewater treatment plant is located west of the drum storage area. The site grades steeply to the north along the base of the new wastewater treatment plant and the drum storage area.<sup>2,3</sup>

Two unlined lagoons, approximately 30 feet apart, with dimensions of 303 by 50 by 5 feet, were located 2,000 feet northwest of the manufacturing plant in 1981. These lagoons received water from the old wastewater treatment plant.<sup>4</sup> The southern lagoon is currently inactive; it has been backfilled, covered, and well vegetated. The northern lagoon is currently active and receives the treated water from the separation pools and the new wastewater treatment plant. Discharge from the lagoon enters an unnamed tributary of Shawnee Run at the northwestern corner of the property, approximately 75 feet north of the lagoon. The tributary joins Shawnee Run approximately 200 to 250 yards west of the site. A third lagoon, which is currently filled and covered, was located approximately 66 feet west of the northern and southern lagoons. Its dimensions and purpose are unknown; however, the lagoon appears to have been approximately 63 feet in length. The lagoon area is flat (minimal slope). Surface water appears to drain to the active lagoon.<sup>2,3</sup>

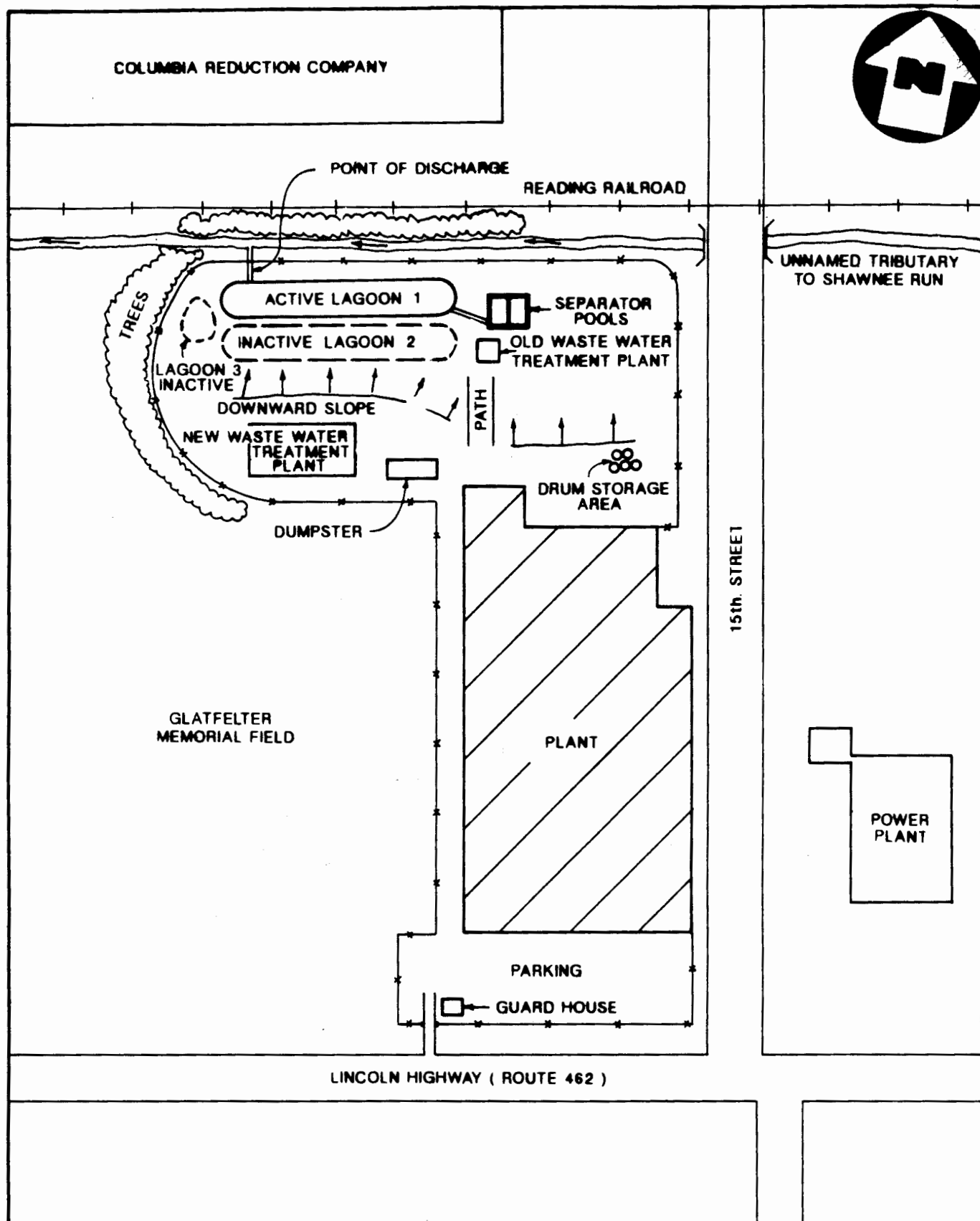


SOURCE: (7.5 MINUTE SERIES) U.S.G.S. COLUMBIA EAST & WEST, PA QUADS.

**SITE LOCATION MAP**  
**ITT GRINNELL, COLUMBIA, PA**  
 SCALE 1: 24000

FIGURE 2.1





**SITE SKETCH**  
**ITT GRINNELL, COLUMBIA, PA.**  
 ( NO SCALE )

**FIGURE 2.2**



Two separation pools are located east of the lagoon area. The former wastewater treatment plant is located north of the manufacturing plant and east of the lagoon area. It currently houses the pumps for the wastewaters.<sup>2,3,5</sup>

### **2.3 Ownership History**

The property was originally owned by the Columbia Malleable Casting Company, from 1925 until 1929, and was sold to Grinnell Corporation in 1930. ITT Grinnell Corporation purchased the facility in 1968 and owned the facility until 1986 when it was purchased by the Grinnell Corporation, which is unrelated to the original Grinnell Corporation. The Grinnell Corporation currently owns and operates the facility.<sup>3</sup>

### **2.4 Site Use History**

The subject site is currently operated as an acid pickling and hot galvanizing department and a foundry for the manufacturing of malleable and ductile iron fittings and jobwork. Utilizing an electric induction technique, the Grinnell Corporation liquidizes iron from scrap steel and then molds the iron in casts (see appendix C). The facility includes a wastewater treatment facility for the treatment of rinse waters from the galvanizing department, a manufacturing plant, two separation pools to separate oil from the surface of noncontact cooling water, and an unlined lagoon that receives the treated waters from the wastewater treatment plant before the water's NPDES-permitted discharge into an unnamed tributary of Shawnee Run (see figure 2.2, page 2-3).<sup>2</sup>

Within the treatment plant is a 4,000-gallon batch acid neutralization treatment tank, a 6,000-gallon tank containing a 50-percent solution of sodium hydroxide, and a 1,000-gallon tank containing a 20-percent solution of sodium hydroxide. The solutions are used to neutralize the waste acidic solutions generated in the galvanizing department. The neutralized acidic solutions are filtered, pressed, and discharged to the unlined lagoon (see appendix D). The resulting galvanizing sludge from the filtered water is transported off site to the Envirite Corporation, in York, Pennsylvania (see appendix E). All other wastes, excluding wastewaters, are transported off site to approved facilities.<sup>2</sup>

ITT Grinnell Corporation operated the facility before Grinnell's purchase on February 21, 1986. The operations of ITT Grinnell paralleled those of Grinnell; however, two additional unlined lagoons were located on site. Records indicate that the southern lagoon, parallel to the currently used lagoon, received polishing and nonpoint-source discharge, cooling water for temperature conditioning from the former treatment plant, and surface runoff. The lagoon may have also been used for the disposal of the metal hydroxide sludge cake, a product of the treatment of rinse waters (pickle liquors and acidic rinse waters) from the galvanizing department.<sup>3,6</sup> The earliest manifests kept by ITT Grinnell in approximately 1978 and 1979 indicated that these sludges were disposed off site. These manifests were not available at the time of this report. Acidic rinse waters and spent pickle liquors from the galvanizing department were allegedly, at some time during ITT Grinnell's ownership, directly discharged into the currently inactive southern lagoon without a permitted treatment plan. However, water quality permits, dated as early as 1956, were held for the subject site. The contents of these permits were unavailable at the time of this report.<sup>2</sup>

Prior to 1982, the wastewater treatment included chemical flocculation and pH adjustment (lime treatment). In 1982, a new wastewater treatment plant was built for batch treatment neutralization of acidic wastewaters and for the filter press.<sup>6</sup>

A third lagoon, backfilled in approximately 1983, was also located west of the larger lagoon. The exact uses of the lagoon are unknown to this date.<sup>3</sup> A water discharge inspection report, dated July 7, 1984, stated that sludge from the northern lagoon was to be put into the old western lagoon.<sup>7</sup>

From 1928 until 1968, the property was operated as a foundry, generating typical foundry wastes, which were stored on site. The wastes included foundry sand, furnace slag, and unusual sand core. These wastes are currently transported off site to the Lancaster Area Refuse Authority Landfill, in Lancaster, Pennsylvania.<sup>3</sup>

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## 2.5 Permit and Regulatory Action History

The ITT Grinnell Corporation was issued Water Quality Management Permit No. 1811 on October 2, 1956 and Water Quality Management Permit No. 3677 on August 21, 1977 by the Pennsylvania Department of Health (the expiration dates were unavailable at the time of this report). The corporation was also issued NPDES Permit No. 3677204 (the issue dates and the expiration date were unavailable at the time of this report). The permits were issued for the discharge of wastewaters and storm waters from the subject site.<sup>8</sup>

The Pennsylvania Bureau of Water Quality issued Water Quality Management Permit No. 3680201 (Part 1) on March 23, 1981 (expiration date unknown) and Water Quality Management Permit No. PA0080195 (Part 1) on January 7, 1981 (expiration date June 30, 1981). The corporation held NPDES Permit No. PA008195 (issued on February 15, 1984; expired on February 15, 1989). The above permits were held for discharge into an unnamed tributary to Shawnee Run.<sup>8</sup>

The ITT Grinnell Corporation currently holds RCRA generator status (No. PAD 0962-6649) for the generation of galvanizing sludge. In addition, Grinnell Corporation holds Air Quality Control Permit No. 36-304-034A for the casting, molding, and sand-handling air systems; Permit No. 36-304-038D for the casting handling, cleaning, and scrap preheat system; Permit Nos. 36-304-046A and 36-304-046B for the three grinders and churn controlled by a fabric collector; Permit No. 36-304-0554B for a foundry casing, grinding, and cleaning system; and Permit No. 36-304-060B for the sand/bentonite casting and handling system (see appendix F). NPDES Permit No. PA0080195 was held for the northern lagoon's discharge into an unnamed tributary of Shawnee Run. The permit covers three outfalls: outfall no. 002 for the discharge of storm water; outfall no. 100 for processed waters from the galvanizing operations; and outfall no. 001 for noncontact cooling water (see appendix G).<sup>8</sup>

A Consent Order and Agreement was issued on December 19, 1980 for violation of Pennsylvania Clean Stream Laws for interim effluent limitations (see appendix H). Monthly inspections pursuant to NPDES permits and the Clean Streams Law were carried out by the Pennsylvania Bureau of Water Quality, which detected effluent excesses of zinc and iron. In addition, the Pennsylvania Bureau of Solid Waste Management performed a preliminary assessment on July 8, 1981 and prepared a field trip report on August 19, 1981.<sup>8</sup>

**2.6 Remedial Action to Date**

No remedial action has been performed at the subject site. A new wastewater treatment plant was built in response to the Consent Order and Agreement issued on December 19, 1980 (see appendix H).<sup>8</sup>

The southern and western lagoons are currently filled and have been revegetated. There are no records of closure plans for the southern and western lagoons (currently inactive lagoons).<sup>8</sup>

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### SECTION 3

### 3.0 ENVIRONMENTAL SETTING

#### 3.1 Water Supply

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[REDACTED]  
[REDACTED] [REDACTED]  
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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

### 3.2 Surface Waters

The area around the site is transected by numerous intermittent streams that flow southwestwardly to the Susquehanna River, which is approximately one mile southwest of the subject site. An unnamed perennial tributary of Shawnee Run that receives the discharge from an artery lagoon runs by the site to the north. The tributary converges with Shawnee Run approximately 1/2 mile southwest of the discharge point. Shawnee Run, in turn, merges with the Susquehanna approximately 0.8 mile southwest of the convergence of the tributary and Shawnee Run.<sup>1,10</sup>

Other major streams of note in the site vicinity are Chickies Creek to the northwest and Kreutz Creek to the southwest.<sup>1,10</sup>

Grubb Lake, located approximately 2.7 miles northeast of the site, is utilized as a surface water intake for the Mountville Municipal Water Authority.<sup>1,9</sup>

Water quality criteria have been established by PA DER for the Susquehanna River for special water-quality protection of high-quality water due to the presence of excellent-quality water and environmental features. The Susquehanna River and Shawnee Run are protected for the maintenance and propagation of fish species and additional flora and fauna that are indigenous to a warm-water habitat.<sup>12</sup>

No wetlands are within the study area to receive drainage from the site.<sup>1,10</sup>

### 3.3 Hydrogeology

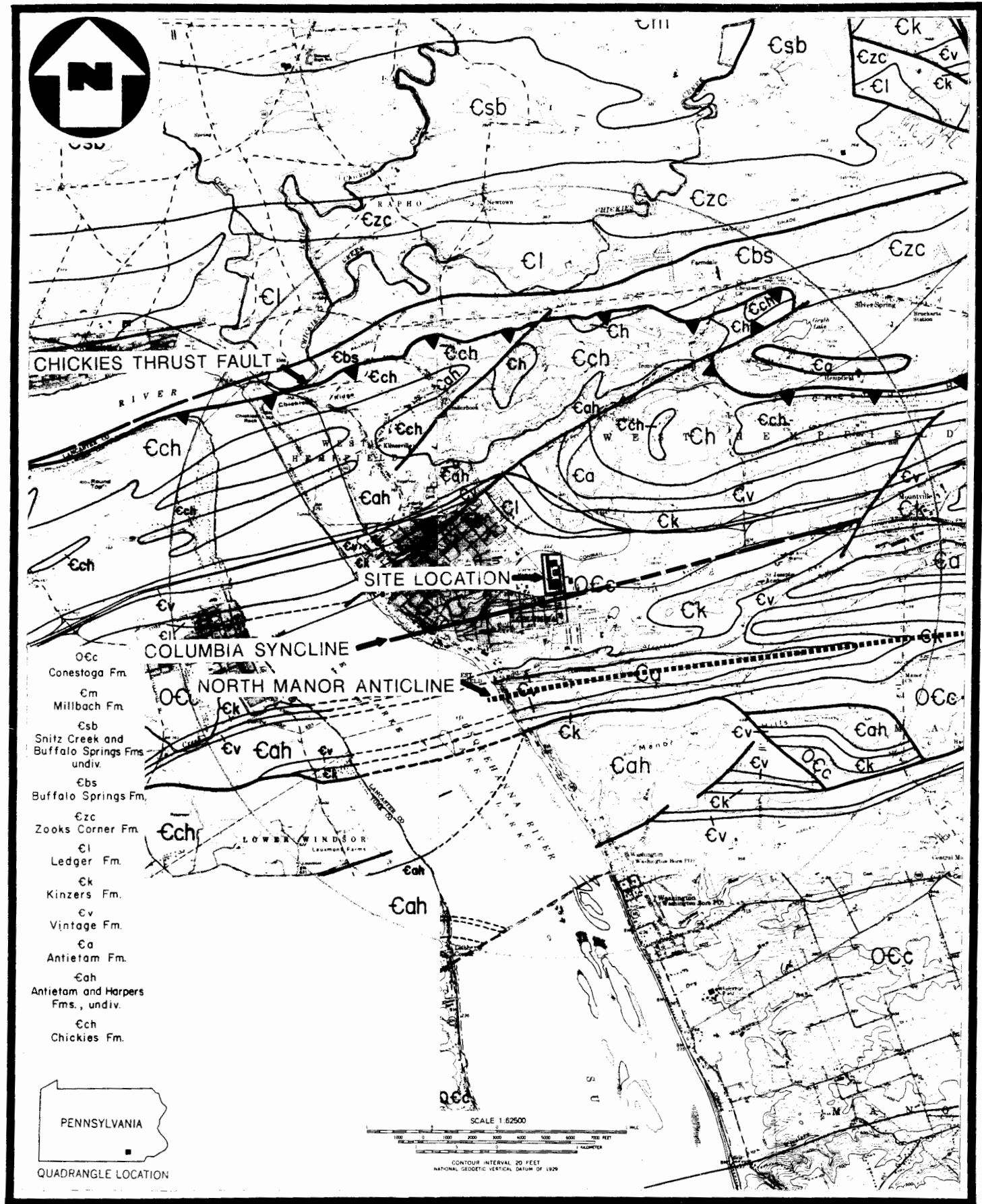
The geologic and hydrogeologic conditions in the study area were researched as part of the site inspection. A preliminary literature review was conducted to determine surface and subsurface geologic conditions, soil characteristics, and the status of groundwater transport and storage.

### 3.3.1 Geology

The ITT Grinnell site is located in the Conestoga Valley Section of the Piedmont Physiographic Province.<sup>13</sup> The Conestoga Valley Section occupies the central half of Lancaster County and is characterized by a 10,000-foot section of limestones and dolomites of Cambrian and Ordovician age, with minor occurrences of quartzite, phyllite, and schist. Much of this stratigraphic sequence has commonly recurring lithologies and numerous facies changes. The site region has a gently rolling topography; relief is controlled by differences in the ability of the carbonates and shales to resist erosion. The drainage pattern throughout the study area is entirely dendritic.<sup>14</sup>

The dominant structural styles found in the site region are upright or slightly overturned isoclinal folds and steeply dipping axial plane cleavage that strikes east-northeast. The North Manor anticline, located 0.9 mile south of the site, is a good example of this structural style (see figure 3.1, pages 3-4). The anticline is isoclinal (having fold limbs that have parallel dips) and slightly overturned to the north and has a steep southward-dipping axial plane parallel to cleavage. The site lies 0.2 mile north of the axial plane of the northeastward-trending Columbia syncline (see figure 3.1, pages 3-4). Faulting, especially thrust features like the Chickies Thrust Fault (two miles north of the site), has added to the structural complexity of the region (see figure 3.1, page 3-4). The thrusting and folding episodes occurred during the Middle Ordovician age Taconic Orogeny, although additional structural adjustments and deformation occurred throughout the Paleozoic.<sup>15</sup>

The site is entirely underlain by the Cambrian-Ordovician age Conestoga Formation (see figure 3.1, pages 3-4).<sup>16</sup> The Conestoga Formation consists of medium gray, fine- to coarse-grained crystalline limestone with commonly occurring clay laminae. Much of the formation also contains thin micaceous beds. The base of the formation is usually marked by beds of conglomerate-containing carbonate clasts. These clasts can range in size from pebbles to boulders and can be a similar or different lithology than the matrix. Coarsely crystalline, silty, and sandy limestones also occur near the base of the formation. The thickness of the Conestoga Formation is not known since multiple folding makes accurate measurement very difficult. However, a good estimate would be approximately 1,000 feet thick.<sup>14</sup>



SOURCE: ATLAS OF PRELIMINARY GEOLOGIC  
QUADRANGLES OF PENNSYLVANIA

FIGURE 3-1

## GEOLOGIC MAP

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Stratigraphically older than the Conestoga Formation and cropping out two miles north of the site is the Cambrian age Buffalo Springs Formation. The Buffalo Springs Formation consists of white to very light pinkish-gray and medium gray to medium dark gray limestones, interbedded with very light pinkish-gray and yellowish-gray to medium dark gray dolomites. Sedimentary structures such as mudcracks, flow casts, ripple marks, and cross laminae indicate a shallow water paleoenvironment. The thickness of the formation is estimated to be between 1,500 and 3,800 feet.<sup>14</sup>

Stratigraphically older than the Buffalo Springs Formation and cropping out 2.7 miles north of the site is the Cambrian age Zooks Corner Formation. The Zooks Corner Formation is a thin- to thick-bedded, medium gray, very finely crystalline dolomite. The dolomite can range in color (white to medium dark gray) and crystallinity (very fine to coarse). Sedimentary structures scattered throughout the formation such as cross laminae, ripple marks, mud cracks, and graded bedding indicate a shallow water paleoenvironment. The total measured thickness of the formation is between 1,550 and 1,600 feet.<sup>14</sup>

Stratigraphically older than the Zooks Corner Formation and cropping out 0.3 mile and 2.2 miles north of the site is the Cambrian age Ledger Formation. The Ledger Formation is a massive, very light gray to light gray, medium to coarsely crystalline, sparkling dolomite. The formation is estimated to be 1,000 feet thick.<sup>14</sup>

Stratigraphically older than the Ledger Formation and cropping out 0.8 mile southeast and 0.35 mile north of the site is the Cambrian age Kinzers Formation. The Kinzers Formation consists of shale, limestone, and dolomite. The dolomite is thick bedded, medium gray to olive black in color, and very finely crystalline. The limestones can be of several types but is primarily a thick-bedded to massive, very light gray to pinkish-gray to medium dark gray, very finely crystalline rock. There are also prominent argillaceous to silty laminae that give the rock a reticulated appearance. The shale is a medium gray to medium dark gray in color. The formation is estimated to be between 300 and 600 feet thick.<sup>14</sup>

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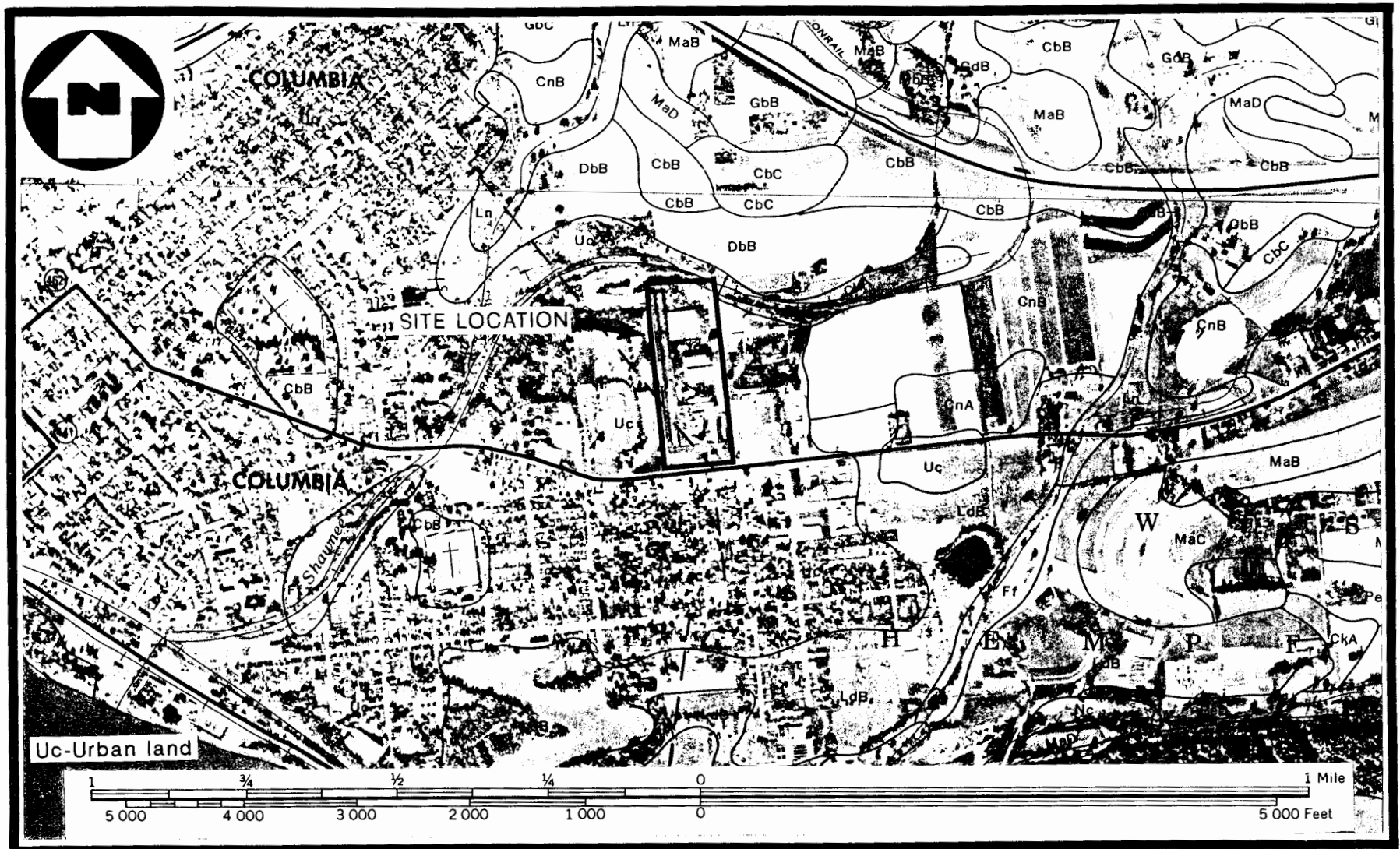
Stratigraphically older than the Kinzers Formation and cropping out 0.5 mile north and 0.7 mile south of the site is the Cambrian age Vintage Formation. The Vintage Formation consists of thick-bedded to massive, medium light gray to medium dark gray, very finely to finely crystalline dolomite. There are also thin shale interbeds and fine, wavy siliceous laminae at some horizons. Occasionally, white, pinkish-gray, and medium gray limestones and dolomites are interbedded with typical Vintage dolomite beds. The thickness of the Vintage Formation is estimated to be between 350 and 550 feet.<sup>14</sup>

Stratigraphically older than the Vintage Formation and cropping out 0.6 mile northeast and 0.75 mile south of the site is the Cambrian age Antietam Formation. The stratigraphically older Harpers Formation crops out 0.9 mile northeast of the site. Although occasionally thick enough to be mapped separately, the formations normally have such a very narrow areal extent that they are mapped as one unit. The Harpers Formation consists of a dark greenish-gray, coarse-grained phyllite and albite-mica schist. It grades upward into the Antietam Formation, a light gray, buff-weathering, fine-grained quartzite sandstone and quartz schist.<sup>17</sup> The maximum thickness of both units is 1,800 feet.<sup>18</sup>

Stratigraphically older than the Harpers Formation and cropping out 1.1 miles northwest of the site is the Cambrian age Chickies Formation. The Chickies Formation consists of a thick-bedded, light gray to white, hard quartzite and quartz schist that is thin bedded in the upper part and locally disintegrates into a fine white, siliceous clay. The basal Hellam Conglomerate Member consists of a coarse cobble conglomerate composed of well-rounded cobbles (three to six inches in diameter) and milky-white quartz pebbles (up to 1/2 inch in diameter) in a finer quartz matrix that firmly cements them.<sup>17,18</sup> The thickness of the formation is about 400 feet.<sup>18</sup>

### **3.3.2 Soils**

The site is underlain by Urban land soils (see figure 3.2, page 3-7).<sup>19</sup> This unit consists of areas where 85 percent or more of the surface is covered by roads, railroads, sidewalks, parking areas, houses, factories, and other structures. Urban land soils are so altered that descriptions of their characteristics are so variable as to be meaningless.



SOURCE: SOIL SURVEY OF LANCASTER COUNTY

FIGURE 3-2

## SOILS MAP

ITT GRINNELL



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### 3.3.3 Groundwater

The formations present in the study area are mostly carbonates; therefore, water movement and storage are a function of fracturing, solution channels, and, to a lesser degree, bedding planes. It is quite likely that these formations are hydraulically interconnected via solution channels and fractures in the limestones and dolomites and via joints and fractures in the clastic rocks.

The Conestoga Formation is the aquifer directly underlying the site. As with most limestones, joint and solution-channel openings provide a secondary porosity of low magnitude. The formation has a low to moderate permeability.<sup>18</sup> Some wells encounter solution openings producing yields of 250 gpm, although typical yields would be in the range of 20 to 25 gpm. In Lancaster County, wells in the Conestoga range in depth from 38 to 502 feet (median depth is 105 feet). A total of 63 wells were tested for specific capacity, and the values obtained range from 0.02 to 130 gpm per foot (median specific capacity is 2.2 gpm per foot).<sup>17</sup>

The Buffalo Springs Formation has a low permeability and a moderate secondary porosity. The median yield of the formation is 10 gpm, and specific capacities range from 0.03 to 200 gpm per foot (median specific capacity is 0.2 gpm per foot).<sup>17,18</sup>

The Zooks Corner Formation has a moderate to high permeability and a low to moderate porosity.<sup>18</sup> Wells in this formation in Lancaster County range in depth from 8 to 400 feet (median depth of 76 feet) and have well yields between 3 and 105 gpm (median yield is 20 gpm). Specific capacities range from 0.04 to 46 gpm per foot (median specific capacity of 0.11 gpm per foot).<sup>17</sup>

The Ledger Formation has a low to high permeability and a low to high secondary porosity.<sup>18</sup> In Lancaster County, well depths in the formation range from 10 to 500 feet, with a median depth of 78 feet. Well yields range from 2 to 550 gpm, with a median yield of 30 gpm; 82 percent of wells tested had yields greater than 25 gpm. Specific capacities range from 0.16 to 135 gpm per foot, with a median specific capacity of 2.5 gpm per foot.<sup>17</sup> It is likely that the Ledger Formation is hydraulically interconnected to the adjacent aquifer of concern (the Conestoga Formation) through an interconnected network of fractures and solution channels.

The Kinzers Formation has a moderate permeability and a moderate secondary porosity.<sup>18</sup> In Lancaster County, 17 wells in the formation range in depth from 16 to 260 feet, although the median depth is only 55 feet. The median yield is 30 gpm, and specific capacities for 10 wells range from 0.05 to 38 gpm per foot (median specific capacity is 1.75 gpm per foot).<sup>17</sup>

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The Vintage Formation has a low permeability and a secondary porosity of moderate magnitude due to joint and solution openings.<sup>18</sup> In Lancaster County, wells in the Vintage range in depth from 12 to 291 feet (median depth is 60 feet). The median yield is 30 gpm, although values as low as 2 gpm and as high as 70 gpm have been recorded. A total of 9 wells have a specific capacity range of 0.03 to 74 gpm per foot (median specific capacity is 0.44 gpm per foot).<sup>17</sup>

The Antietam and Harpers Formations have a low permeability and a low secondary porosity.<sup>18</sup> Although these units are commonly mapped together in Lancaster County, well data from the individual formations are available. Well depths in the Antietam range from 21 to 245 feet (median depth is 113 feet), and well yields range from 3 to 40 gpm (median of 0.75 gpm). Well depths in the Harpers range from 28 to 368 feet (median depth is 175 feet), and well yields range from 1.5 to 10 gpm (median of 5 gpm).<sup>17</sup>

The Chickies Formation has a very low permeability and a low secondary porosity.<sup>18</sup> Thirteen wells in the formation in Lancaster County range in depth from 45 to 100 feet (median depth is 127 feet) and have well yields between 1 and 30 gpm (median well yield is 6 gpm). Specific capacities from two wells were each about 0.2 gpm per foot.<sup>17</sup>

Based on topography, the direction of shallow, unconfined groundwater flow at the site will be to the north-northwest, toward a tributary of Shawnee Run. The area southwest of the Susquehanna River is hydraulically isolated from the site since the Susquehanna is a major discharge point for groundwater flowing from the northeast.<sup>1</sup>

### **3.4 Climate and Meteorology**

The following values were compiled from the Ephrata, Pennsylvania region, which is approximately 20 miles northeast of the site. This is the closest weather station to the site. The mean annual temperature of this area is 52.3°F. January is the coldest month, with a mean temperature of 29.0°F. July is the warmest month, with a mean annual temperature of 74.0°F. The mean annual precipitation for this area is 43.50 inches. The month with the highest precipitation is August, with a mean value of 4.47 inches. January has the lowest precipitation, with a mean value of 3.11 inches. The mean annual lake evaporation for this area is 34 inches, leaving a net precipitation of approximately 9.5 inches per year. The 1-year, 24-hour rainfall is 2.5 inches.<sup>20</sup>

### **3.5 Land Use**

The three-mile-radius study area encompasses the town of Columbia, the town of Wrightsville, and West Hempfield Township. The subject site is located on the western border of the town of Columbia, a light commercial and industrial urban area.<sup>10</sup> The site area to the north is designated as an agricultural preserve that provides permanent protection from projects that could result in the conversion of farmland to other uses. The area to the south is a planned agricultural community.<sup>21</sup> A playing field is adjacent to the subject site to the west. Railroad tracks surround the site area to the north, west, and south.<sup>2</sup> The Susquehanna River, which borders the southern portion of the Columbia town limits, is widely used for fishing and recreation.<sup>12</sup>

### **3.6 Population Distribution**

The western and southern portions of the site area are located in the town of Columbia, and the northern and eastern portions are in the township of West Hempfield. Assuming 3.8 persons per dwelling, and multiplying that figure by the number of households on U.S.G.S. topographic maps for Columbia East, Columbia West, Red Lion, and Safe Harbor, approximately 20,643 people live within the 3-mile radius, approximately 13,859 persons live within a 2-mile radius, and approximately 9,206 people live within a 1-mile radius of the site.<sup>1,10</sup>

### **3.7 Critical Environments**

According to the United States Department of the Interior, Fish and Wildlife Service, there are two federally listed endangered birds expected to be found as transient species in the site area. They are the bald eagle (Haliaeetus leucocephalus) and the peregrine falcon (Falco peregrinus).<sup>22</sup> However, there is no listed critical habitat in the site area for these species.<sup>23</sup>

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## SECTION 4

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#### **4.0 WASTE TYPES AND QUANTITIES**

The waste materials generated from the ITT Grinnell site included foundry baghouse dust, furnace slags, unusable sandcores, sand, sludge from the galvanizing department, and spent pickle liquors. A currently inactive lagoon, 320 by 50 by 5 feet in size, received the effluent from the wastewater treatment plant. During the latter years of operation, ITT Grinnell handled and generated waste materials in the same manner as the Grinnell Corporation currently does. The earlier waste-handling and quantities are not known. However, using a 1-time full volume of the unlined lagoon, the waste quantity would be 3,086 cubic yards.<sup>3,8</sup>

The Grinnell Corporation transports the baghouse dust, furnace slag, and spent foundry sands (21,000 tons per year) to the Lancaster Area Refuse Authority Landfill, in Lancaster, Pennsylvania. Core wastes are transported off site to S.S. Fisher Corporation, in Lancaster, Pennsylvania. Galvanizing sludge (70 tons per year) is placed into a dumpster outside the wastewater treatment and is transported off site to Envirite Corporation, in York, Pennsylvania. Spent pickle liquor and acid rinse water are neutralized in the wastewater treatment plant before their discharge into the active lagoon and eventually into an unnamed tributary of Shawnee Run. Grinnell Corporation currently holds RCRA generator status (no. PAD09626649) for the generation of galvanizing sludge.<sup>8</sup>

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## SECTION 5

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## 5.0 FIELD TRIP REPORT

### 5.1 Summary

On Wednesday, July 13, 1988, NUS staff members (b) (4) performed environmental sampling in support of the site investigation at the ITT Grinnell facility in Columbia, Lancaster County, Pennsylvania. The field team was accompanied by ITT Grinnell representatives Michael Millhouse, Joseph Sutor, and Terry Wittenberg. Pennsylvania Department of Environmental Resources Superfund inspector David Vollero was also informed of the field schedule. Weather conditions were clear and sunny, with temperatures between 85°F to 90°F.

A total of seven aqueous and five solid samples, including blanks and duplicates, were collected (see figure 5.1, page 5-4). Photographs were taken at the site (see figures 5.3 and 5.4, pages 5-7 and 5-8, and the photograph log, section 5.5).

#### Deviations from the Sampling Plan

- One additional auger sample was collected from a previously unidentified inactive lagoon. The solid duplicate sample was also collected from this location.

### 5.2 Persons Contacted

#### 5.2.1 Prior to Field Trip

Michael Millhouse  
Terry Wittenberg  
ITT Grinnell Corporation  
1411 Lancaster Avenue  
Columbia, PA 17512  
(717) 684-4400

(b) (6)

(b) (6)

ORIGINAL  
(Red)

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### 5.2 Persons Contacted

#### 5.2.1 Prior to Field Trip

THE NEW YORK PUBLIC LIBRARY

ASTOR LENOX

TILDEN FOUNDATION

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### 5.2.2 At the Site

Michael Millhouse  
Terry Wittenberg  
Joseph Sutor  
ITT Grinnell Corporation  
1411 Lancaster Avenue  
Columbia, PA 17512  
(717) 684-4400

### 5.2.3 Water Supply Well Information

The following off-site wells were sampled during the site investigation. For the locations of these wells, see figure 5.2 (page 5-5). Completed well questionnaires can be found in appendix J.

(b) (6)



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(Red)

#### **5.2.2 At the Site**

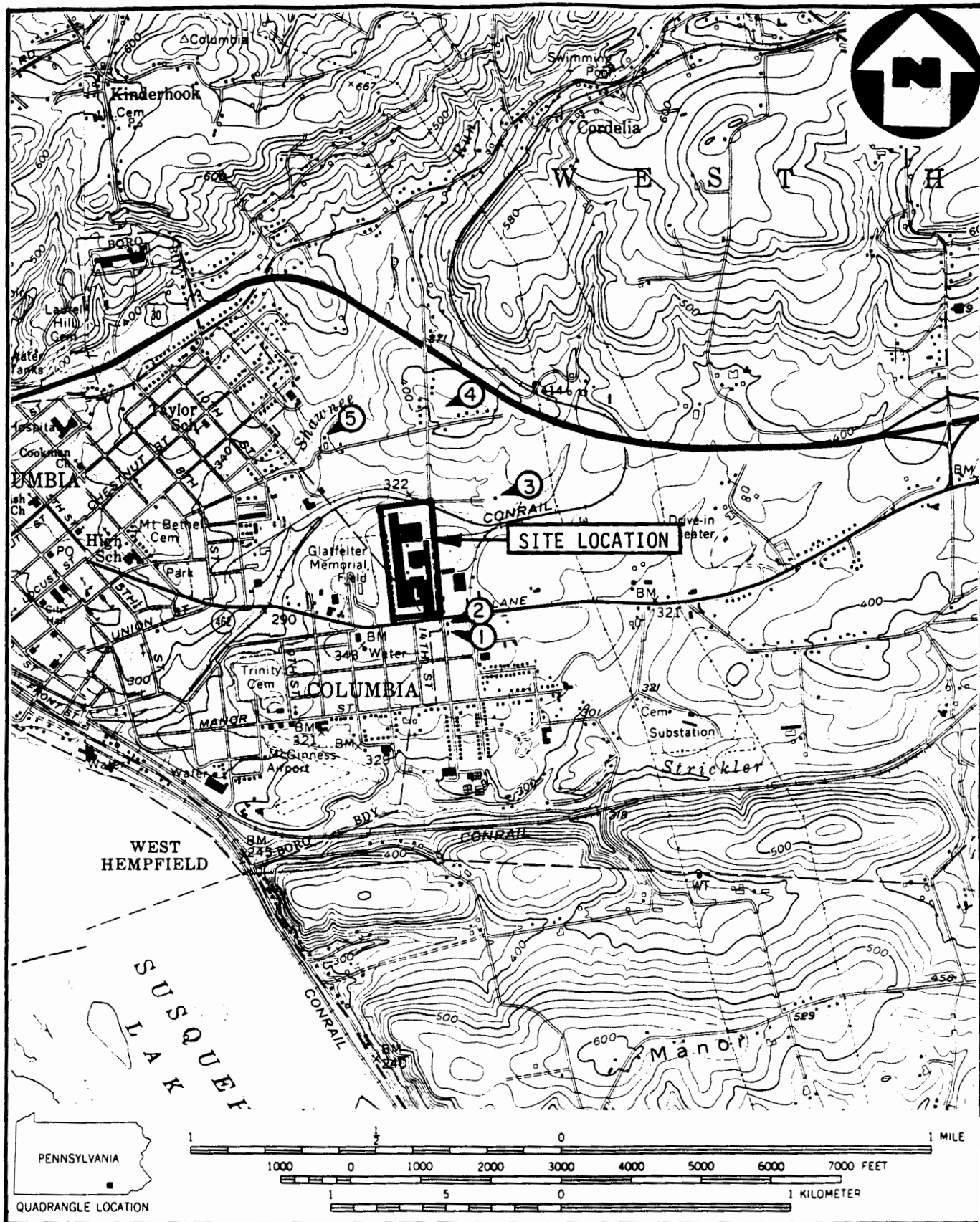
Michael Millhouse  
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#### **5.2.3 Water Supply Well Information**

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#### 5.4 Site Observations

- No above-background HNU or mini-alert readings were recorded.
- There are three on-site lagoons located at the northern end of the property. The active lagoon is approximately 303 by 55 feet and is closest to an adjacent unnamed tributary to Shawnee Run. The larger of the inactive lagoons is 30 feet south of the active lagoon and is approximately the same size. The older, inactive lagoon is located to the west of the other lagoons, near the tree line. Its dimensions are unknown; however, it appears to have been approximately 63 feet in length. Both inactive lagoons have been backfilled and are revegetated. No stained areas were observed.
- Ponded water was observed in the larger inactive lagoon area. Although several springs reportedly originate from the slope below the present wastewater treatment plant, none were observed by NUS staff members.
- The lagoon area is flat (minimal slope). Surface water appears to drain to the active lagoon, which discharges to an unnamed tributary of Shawnee Run. The tributary joins Shawnee Run approximately 200 to 250 yards to the west of the site.
- Access to the lagoon area is restricted by a chain-link fence.
- A drum storage area was observed to the east of the lagoon area, near the plant buildings. Some drums were being stored on the ground while others were stored on pallets. The drums are reportedly empty hydraulic oil containers.



SOURCE: (7.5 MINUTE SERIES) U.S.G.S. COLUMBIA EAST & WEST, PA QUADS.

OFF-SITE PHOTO LOCATIONS  
ITT GRINNELL, COLUMBIA, PA  
 SCALE 1: 24000

FIGURE 5.3



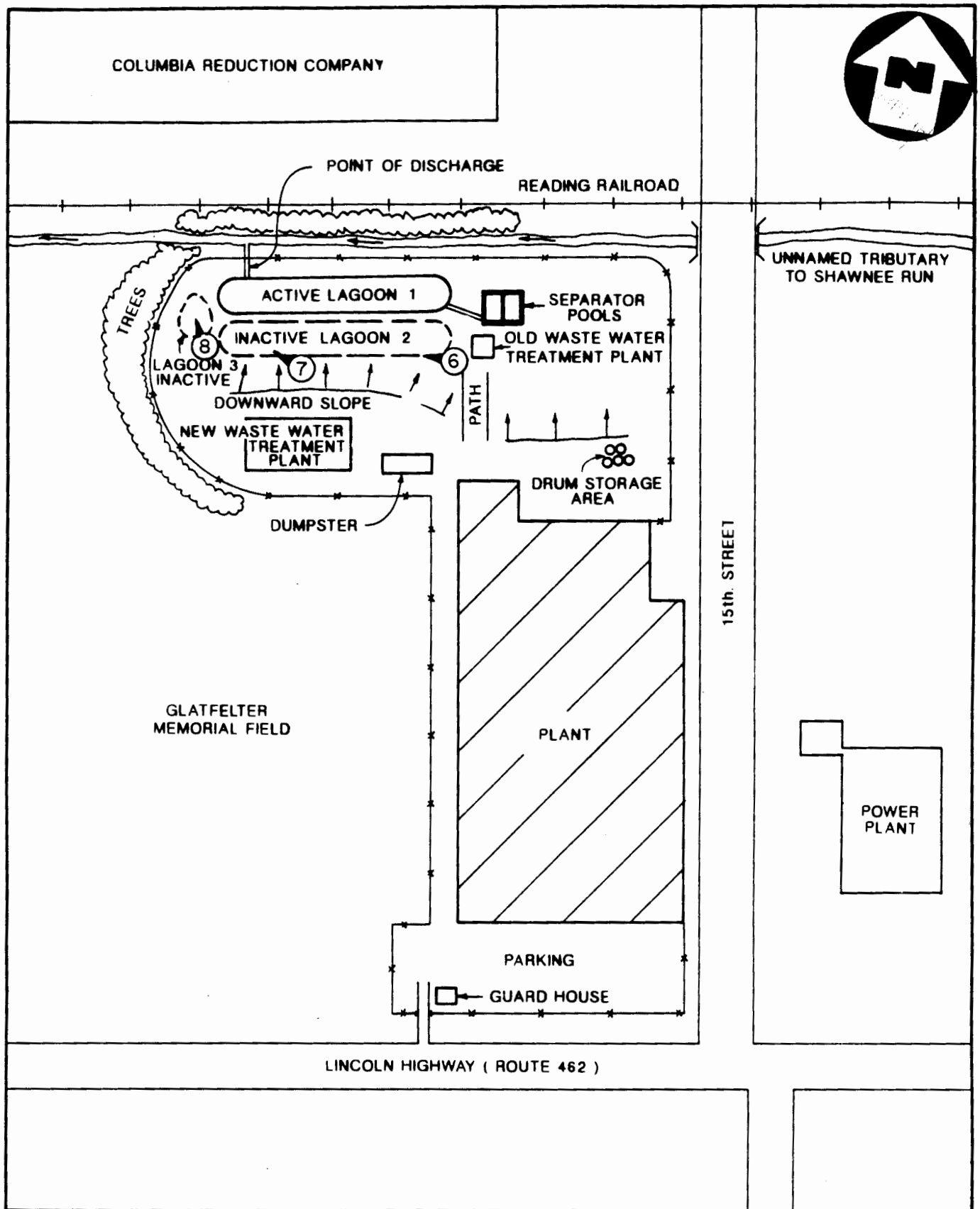
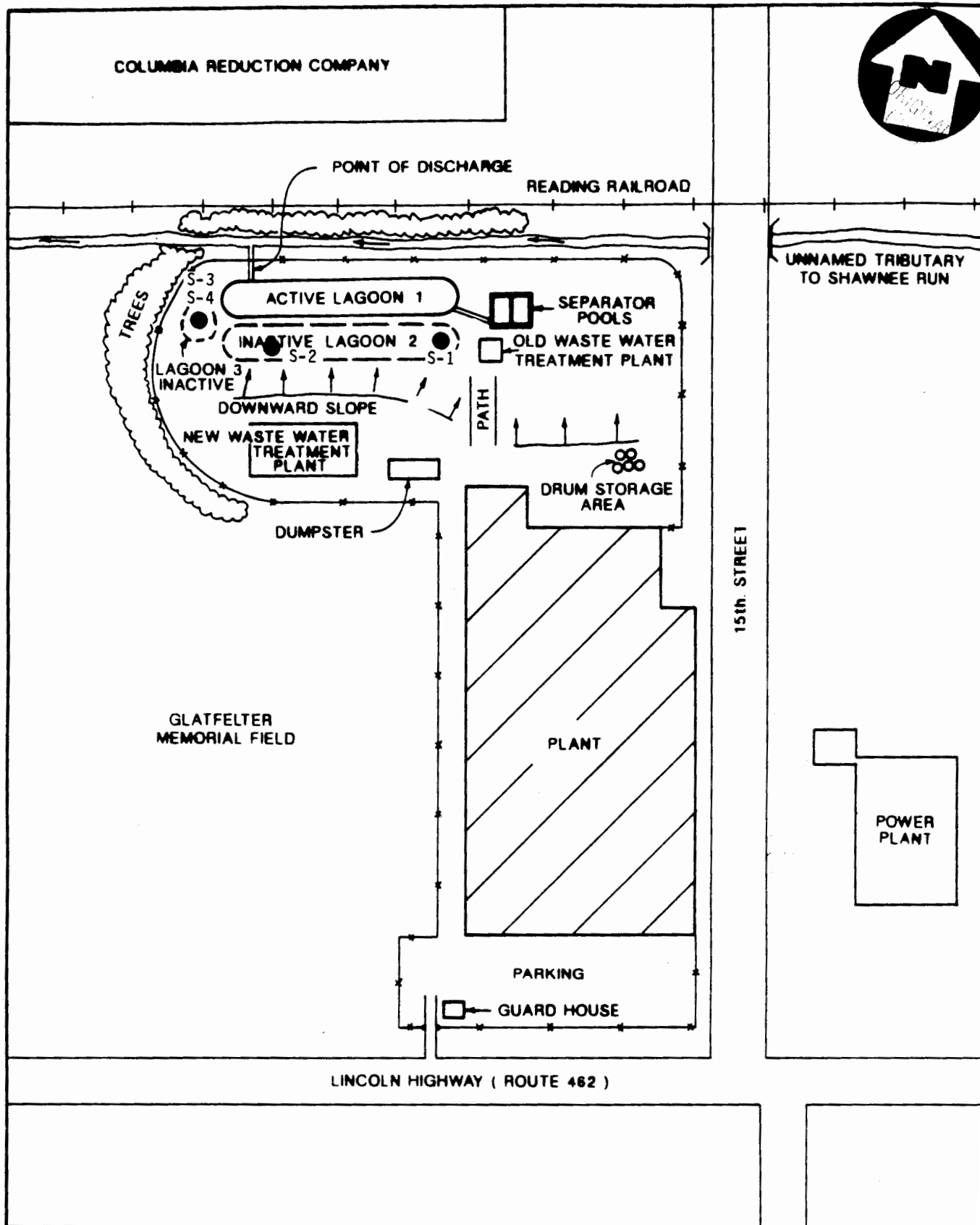


PHOTO LOCATION MAP  
ITT GRINNELL, COLUMBIA, PA.  
 ( NO SCALE )

FIGURE 5.4

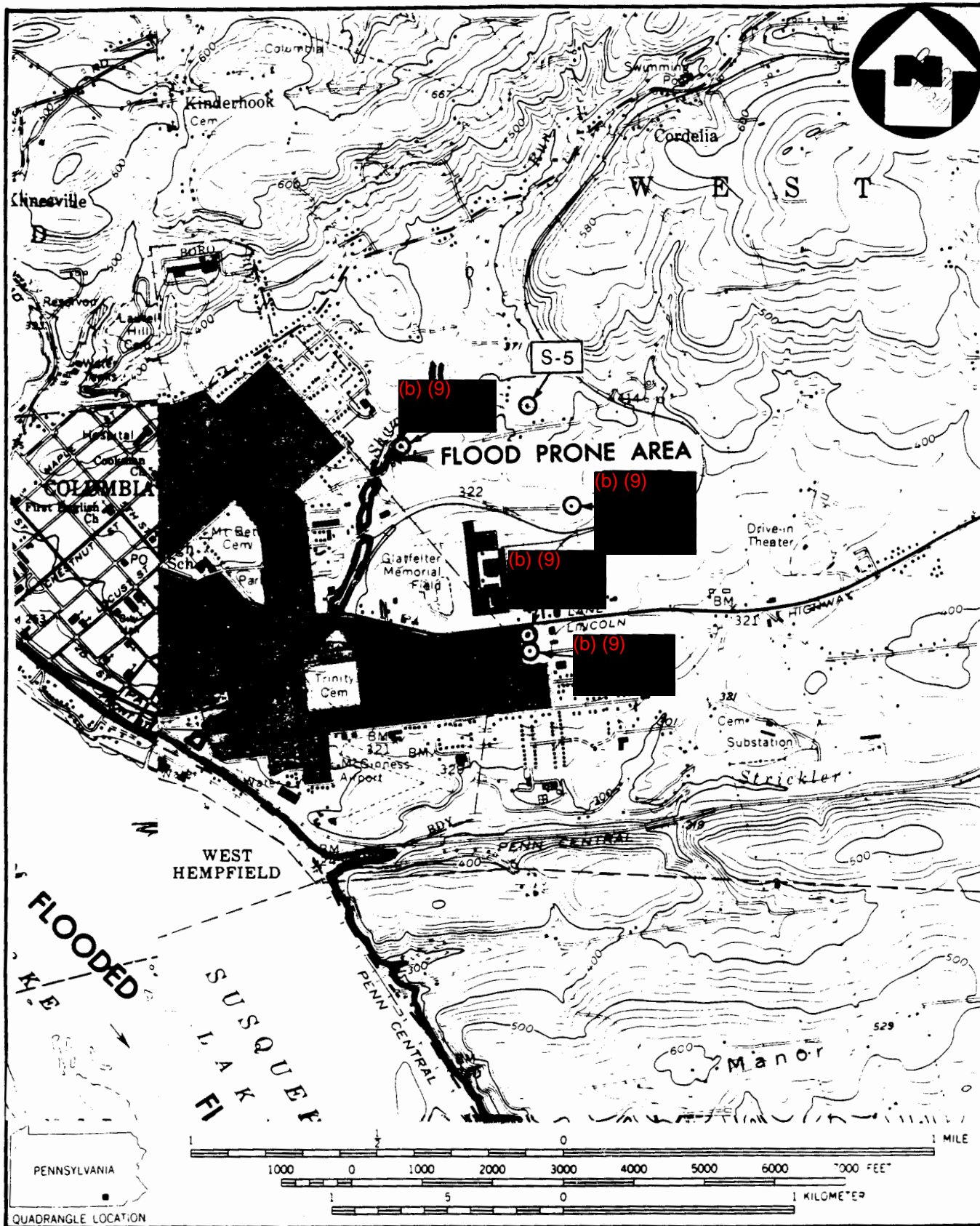




SAMPLE LOCATION MAP  
ITT GRINNELL, COLUMBIA, PA.  
 ( NO SCALE )

FIGURE 5.1





SOURCE: (7.5 MINUTE SERIES) U.S.G.S COLUMBIA EAST & WEST, PA. QUAD

## OFF SITE SAMPLE LOCATION MAP

ITT GRINNELL, COLUMBIA, PA.

SCALE 1: 24000

FIGURE 5.2



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SECTION 8

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## 8.0 TOXICOLOGICAL EVALUATION

### 8.1 Summary

Elevated levels of some metals were detected in the inactive lagoon soil samples. Zinc was found at levels for which phytotoxicity and effects on livestock have been seen; however, these effects are pH-dependent. The land is not used to support agriculture or animals, and access is restricted. Other metals detected at notable levels were lead, antimony, cadmium, and manganese. All of the metals are soil bound (this, too, is pH-dependent), and the vegetative cover reduces exposure potential. No significant health effects can be predicted from the metals at these levels.

Phenol, 4-methylphenol, and 2,4-dimethylphenol were confidently identified at low levels, and bis(methylethyl)phenol and two C<sub>3</sub>-alkylphenols were tentatively identified in on-site soil. There is no evidence to suggest that these chemicals would produce a significant environmental impact. Seven C<sub>3</sub>-alkylbenzenes were tentatively identified in on-site soil. Some leaching of these compounds to groundwater is possible; the potential impact on groundwater could not be assessed, because the depth to groundwater in this area is unknown. Alkylbenzenes are generally considered to be relatively nontoxic except at acute high-level exposure. Direct contact with soil is unlikely.

Polycyclic aromatic hydrocarbons (PAHs) were detected at low levels in the southern inactive lagoon. No significant environmental impacts would be expected from the levels present.

A polychlorinated biphenyl (PCB), Aroclor 1254, was detected at low levels in some on-site soil. This persistent compound is not well absorbed from soil. There is no evidence to suggest that these levels would result in a significant environmental impact.

No significant contamination was measured in any of the home wells, with the exception of one phthalate ester at a low level.

## 8.2 Support Data

In assessing the inactive lagoon soil, different exposure pathways must be considered. Surface soil runoff is reported to drain into the active lagoon (see section 2.2), and the active lagoon discharges into an unnamed tributary to Shawnee Run. This discharge is monitored by the Pennsylvania Bureau of Water Quality Management, has an NPDES permit, and is beyond the scope of this report. The focus, therefore, will be on direct contact as the primary exposure route. Further impacts of wastewater on inactive lagoons are not expected, since waste is piped directly to the separation pools and from there to the active lagoon.

Notable levels of zinc were detected in all on-site soil samples (from 10,100 to 12,300 mg/kg), which is not surprising at a facility where zinc is used to coat iron (galvanizing). It is significant that this area, which consists of two inactive lagoons, is well vegetated. Zinc can be phytotoxic, but a pH close to neutral can minimize plant uptake of this metal.<sup>1,2</sup> Livestock have been reported to show effects from consuming forage grown in soil with zinc levels up to approximately 10,000 mg/kg.<sup>1,2</sup>

The ITT Grinnell site is an active facility surrounded by a fence; animals are not deliberately kept on site, and accidental entry of wild animals is not likely. The site is not used for agricultural purposes. Zinc is not noted for its toxicity to humans and is, in fact, an essential element; absorption from soil is usually not significant because of its tendency to bind to soil particles. At high levels, zinc can irritate the gastrointestinal tract.<sup>3</sup> Some zinc salts can cause dermatitis.<sup>4</sup> Direct contact with this soil is unlikely because the area is fenced and well vegetated, and this portion of the site is inactive.

Elevated levels of cadmium were detected in all on-site soils, ranging from 2.8 to 7.9 mg/kg. Cadmium toxicity is generally observed from occupational exposure to high concentrations of dusts and fumes. At such high levels, it has been seen to affect the prostate and the renal, respiratory, and hematopoietic systems.<sup>4</sup> No significant environmental impact is expected at these levels. Possible direct contact would be even less significant when cadmium's adsorption to soil and the presence of vegetation are considered.

Elevated levels of lead were detected in the soil of the inactive lagoon located south of the active lagoon (600 mg/kg and 648 mg/kg). Lead at high levels has been known to affect the hematopoietic, renal, and nervous systems.<sup>3</sup> Children, because of their high absorption rate and developing nervous systems, are especially vulnerable. At this site, direct contact is limited, and no children are expected on site. Lead also binds to soil particles, limiting its availability.<sup>5</sup> No significant environmental impacts are expected from these levels.

One soil sample taken from the southern inactive lagoon revealed an elevated level of antimony (62.7 mg/kg). Antimony has produced toxicity at high levels in industrial settings; it has been found to be an irritant and an emetic. Like most metals, it is slowly absorbed and is not generally available when adsorbed onto soil particles.<sup>3,4</sup> From the limited data available, it appears that this may be a localized rather than widespread contamination; however, no definite conclusions can be drawn.

One soil sample from the southern inactive lagoon revealed an elevated level of manganese (7,600 mg/kg); the other revealed a level (6,930 mg/kg) below the upper range of typical nonpolluted eastern United States soils but significantly higher than background (965 mg/kg).<sup>6</sup> Manganese is a minor irritant; toxicity is primarily observed in occupational settings from inhalation exposure.<sup>3,4</sup> It is an essential element; daily intake ranges from 2 to 9 mg, and gastrointestinal absorption is estimated to be less than five percent.<sup>3</sup> It is not absorbed well from soil; there is no evidence to suggest significant environmental impacts.

All of the metals, since they are strongly soil bound, are generally not very mobile. Leaching into groundwater is rarely a concern when considering soil metals. A low soil pH, however, can increase the mobility and availability of soil metals, including plant uptake. It is possible that acidic wastewater was once dumped into the inactive lagoon (see section 1.2). However, stressed vegetation might be observed with the zinc levels present if soil pH were low; this was not observed during the site visit. From available data, the soil pH cannot be definitely determined. Surface runoff of metals is unlikely because of their low mobility and the existence of vegetation at the site.

In the southern inactive lagoon, phenol (910 ug/kg and 4,400 ug/kg), 4-methylphenol (440 ug/kg), and 2,4-dimethylphenol (280 ug/kg and 930 ug/kg) were detected. Bis(methylethyl)phenol (1,800 ug/kg and 2,000 ug/kg), and two C<sub>3</sub>-alkylphenols (32,000 ug/kg) were tentatively identified. Phenols can be a wastewater component from steel mill operations.<sup>7</sup> These semivolatile compounds are irritants; the confidently identified chemicals are experimental neoplastigens (a neoplastigen is a substance that causes unusual or abnormal tissue growth).<sup>8</sup> There is no evidence to suggest that these levels would pose a health hazard.

Seven C<sub>3</sub>-alkylbenzenes were tentatively identified at 99,000 ug/kg. Local wells draw water from the Conestoga Formation at depths from 100 to 500 feet (see section 3.1). This formation, on the whole, has typical well depths from 38 to 502 feet (see section 3.3.3). The exact depth to groundwater at this particular point is undetermined. The potential exists for alkylbenzenes, as semivolatile compounds, to leach through soil to some degree.

A typical C<sub>3</sub>-alkylbenzene is cumene. It is described as being mildly toxic via skin contact, causing irritation and central nervous system depression at high levels.<sup>8</sup> However, alkylbenzenes are considered to be relatively nontoxic except during acute exposure to high concentrations; they appear to be detoxified by metabolic processes.<sup>3</sup>

PAHs were detected at low levels in the southern inactive lagoon soil sample (up to 5,360 ug/kg) and the background soil sample (49 ug/kg). PAHs are generally nonvolatile, immobile, and persistent in the environment. They occur widely in petroleum products and from the combustion of organic material; therefore, they are often found near roads and railroads. Note that the ITT Grinnell site is bordered by roads to the east and south and a railroad to the north. Although PAHs can cause dermatitis in sensitive individuals, no significant environmental impact is expected from these levels. Two of the PAHs found in one of the samples are suspect human carcinogens [benz(a)anthracene (520 ug/kg) and benzo(a)pyrene (490 ug/kg)]. Due to the no-threshold theory of carcinogenicity, a slight increase in cancer risk cannot be ruled out, although prolonged, repeated exposure is not expected to occur.

Aroclor 1254 was detected in the soil of the inactive southern lagoon at 1,200 ug/kg and 640 ug/kg. These are far below the EPA action level of 25,000 ug/kg recommended for limited-access areas. While PCBs have been reported to cause chloracne, liver damage, and cancer, usually from high-level chronic exposure, they are strongly adsorbed to soil and not well absorbed.<sup>4,5</sup> They are persistent and usually not mobile.<sup>5</sup> Because of this and the high degree of vegetation, PCBs in surface soil runoff into the tributary would be expected to be minimal. At such levels, no significant environmental impact would be expected.

Groundwater flow is reported to be to the north and northwest (see section 3.3.3). Home wells to the northwest, northeast, and southwest were sampled. Bis(2-ethylhexyl) phthalate (DEHP) was detected in one home well sample, but not its duplicate, at 36 ug/l. No criteria have been developed for DEHP, but a risk reference dose (RfD) of 20 ug/kg per day has been given.<sup>9</sup> For a 70-kilogram person consuming 2 liters of water from this well every day, an exposure of 1 ug/kg per day would result. This is about 20 times less than the RfD. DEHP is also considered to be a suspect human carcinogen with a cancer potency of  $1.4 \times 10^{-2}$  (mg/kg/day)<sup>-1</sup>.<sup>9</sup> From this, a theoretical cancer risk of approximately  $1.5 \times 10^{-5}$ , or about 15 cases per million people, may be calculated. It should be noted that phthalates are ubiquitous in the environment; the general population is exposed to them through many more significant routes, including plastics.<sup>3</sup> In conclusion, no acute or chronic effects are expected; however, some increase in the overall cancer risk cannot be ruled out. No other significant levels of organic or inorganic contaminants were detected in home wells.

A background soil sample was obtained. Fluoranthene, a PAH, was detected at 49 ug/kg. No adverse effects are expected from contact with this soil.

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Report prepared by Jennifer Hubbard  
Jennifer Hubbard, Toxicologist

Report reviewed by Elizabeth A. Quinn  
Elizabeth A. Quinn, Senior Toxicologist